ELECTRO CHEMISTRY PART- 1

1. Which of the following conducts electricity?
   1) Molten Urea 2) crystalline sodium chloride
   3) Fused sodium chloride 4) glass
2. An electronic conductor in the following is
   1) Solid NaCl 2) Diamond 3) Graphite 4) aqueous HCl
3. The decrease in electrical conductivity of metals with increase in temperature is due to increase in
   1) the velocity of electrons 2) the resistance of the metal
   3) the number of electrons 4) the number of metal atoms
4. Which of the following is a mixed conductor of electricity
   1) Aqueous KCl 2) sodium in liquid NH_3
   3) Cane sugar solution 4) CdS &CuS
5. In metals and graphite the conduction is due to the flow of
   1) Cations 2) anions 3) electrons 4) both 1&2
6. In which of the following, HCl conducts electricity to large extent?
   1) Liquid state 2) in aq. solution
   3) In benzene solution. 4) Vapour state
7. The reason for increase in electrical conduction of electrolyte with increase in temperature is
   A) increase in the number of ions
   B) increase in the speed of ions
   C) increase in the degree of dissociation of electrolyte
   1) A, B only 2) B, C only
   3) A, C only 4) A, B, C
8. Dissociation of an electrolyte in water into negative and positive ions is called
   1) Electrolysis 2) hydrolysis 3) decomposition 4) ionization
9. Choose the wrong statement
   1) Electrical conductance of an electrolytic conductor increases with increase in temperature
   2) Electrical conductance of a metallic conductor increases with increase in temperature
   3) Electrical conductance of a metallic conductor decreases with increase in temperature
   4) Degree of dissociation of an electrolyte increases with dilution

10.

LIST - 1	**LIST - 2**
A) Electronic conductor	1) Aqueous urea solution
B) Non-electrolyte	2) Solid sodium
C) Electrolytic dissociation	3) Electrolytic conductor
D) Arrhenius	4) Radioactivity increases
	5) Conductivity rises with temperature

The correct match is

	A	B	C	D
1)	5	1	2	3
3)	2	1	5	3

	A	B	C	D
2)	5	2	1	4
4)	2	5	1	4

11. Which of the following is 100% ionised at any dilution?
    1) CH_3COOH 2) HCN 3) NaCl 4) NH_4OH

12. Which of the following (1M) conducts more electricity?
1) sulphuric acid 2) boric acid 3) acetic acid 4) phosphorous acid

13. The degree of dissociation of an electrolyte in aqueous solution depends on
A) Temperature
B) Concentration of the electrolyte
C) Nature of the electrolyte
1) Only A 2) Only A, B
3) Only B, C 4) A, B, C

14. What happens at infinite dilution in a given solution?
1) The degree of dissociation is unity for weak electrolytes
2) The electrolyte is 100% ionised
3) All inter ionic attractions disappear
4) All of these

15. At infinite dilution the degree of dissociation for Urea in aqueous solution is

1) 0 2) 0.5 3) 0.99 4) 1
Hint; urea is a non-electrolyte.

16. Choose the correct statement regarding electrolytic cell
1) It is a device in which chemical energy is converted into electrical energy
2) Anode is shown by negative sign
3) Oxidation reaction takes place at the anode
4) Electrons flow from cathode to anode

17. The following are some statements about electrolytic cell
A) in this chemical energy is converted into electrical energy
B) in this cell electrons flow from anode to cathode
C) in this cell reduction takes place at cathode
D) in this cathode is a +ve electrode
The correct combination is
1) Only B 2) only C
3) Only C, D 4) only B, C

18. The conduction of a salt solution in water depends on the
1) extent of its ionization 2) size of its molecules
3) shape of molecules 4) size of solvent molecules

19. In the electrolytic cell, flow of electrons is from
1) Cathode to anode in the solution
2) Cathode to anode through external circuit
3) Anode to cathode through external circuit
4) All of these

20. The unit of specific conductivity is)
1) ohms cm^{-1} 2) ohms cm^{-2} 3) ohm^{-1} cm 4) ohm^{-1} cm^{-1}

21. The unit of equivalent conductivity is
1) ohm cm 2) ohm^{-1} cm^2 $(g\ equivalent)^{-1}$
3) ohm cm^2 (g equivalent) 4) S cm^{-2}

22. The equivalent conductance of 1N solution of an electrolyte is nearly
1) Same as its specific conductance
2) 10^{-3} times its specific conductance
3) 10^2 times more than its specific conductance
4) 10^3 times more than its specific conductance

23. (A): The molar conductance of weak electrolytes is low as compared to that of strong electrolytes at moderate concentrations
(R): Weak electrolytes at moderate concentrations dissociate to a much greater extent when compared to strong electrolytes
1) Both A and R are true and R is correct explanation to A
2) Both A and R are true but R is not correct explanation to A
3)A is true and R is false
4) Both A and R are false.

24. Which of the following has highest electrical conductivity in aqueous solutions ?
1) 0.1 M acetic acid 2) 0.1 M chloroacetic acid
3) 0.1 M chloroacetic acid 4) 0.1 M tri chloroacetic acid

25. If the specific conductance and conductance of a solution is same, then its cell constant is equal to
1) 1 2) 0 3) 10 4) 100

26. In electrolysis of dilute H_2SO_4, what is liberated at anode in presence of inert electrode?
1) H_2 2) SO_2 3) SO_3 4) O_2

27. Which process occurs in the electrolysis of aqueous solution of nickel chloride at nickel anode?
1) $Ni^{2+} + 2e \rightarrow Ni$ 2) $2H^+ + 2e \rightarrow H_2$
3) $2Cl^- \rightarrow Cl_2 + 2e$ 4) $Ni \rightarrow Ni^{2+} + 2e$

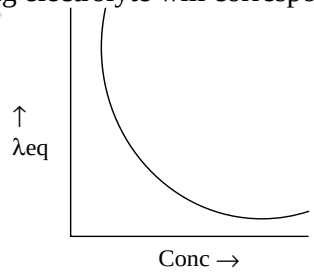
28. Molten $CuCl_2$ is electrolysed using platinum electrode. The reaction occurring at anode is)
1) $2Cl^- \longrightarrow Cl_{2\,(g)} + 2e^-$ 2) $Cl_{2(g)} + 2e^- \rightarrow 2Cl^-$
3) $Cu^{2+} + 2e^- \longrightarrow Cu_{(s)}$ 4) $Cu_{(s)} \rightarrow Cu^{2+} + 2e^-$

29 During the electrolytic reduction of alumina, the reaction at cathode is
1) $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$ 2) $2F^- \rightarrow F_2 + 3e^-$
3) $Al^{3+} + 3e^- \rightarrow Al$ 4) $2H^+ + 2e^- \rightarrow H_2$

30. Specific conductivity of a solution
1) increases with dilution 2) decreases with dilution
3) remains unchanged with dilution 4) depends on mass of electrolyte.

31. A solution of concentration 'C' g equiv/litre has a specific resistance R. The equivalent conductance of the solution is"
1) R/C 2) C/R 3) $\frac{1000}{RXC}$ 4) $\frac{1000R}{C}$

32 A graph is drawn between the Λ_{eq} values and concentrations of an electrolyte. Which of the following electrolyte will correspond to the graph given?



1) KCl 2) $CaCl_2$ 3) $NiSO_4$ 4) CH_3COOH

33. For which case 'Λ' values v/s $\sqrt{c}$ shows a straight line
1) HCl 2) HCOOH 3) H_3BO_3 4) CH_3COOH
Hint; strong electrolytes give straight line.

34. When an aqueous solution of copper sulphate is electrolysed using copper electrodes the reaction at the anode is represented by
1) $H^+ + e^- \rightarrow H$ 2) $Cu^{2+} + 2e^- \rightarrow Cu$
3) $SO_4^{2-}(aq) \rightarrow SO_4 + 2e^-$ 4) $Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$

35. Aqueous solution of $CuSO_4$ is electrolysed using inert electrodes till the blue coloured solution becomes colourless. The colourless solution formed is
1) $Cu(OH)_2$ 2) H_2SO_4 3) $CuSO_4$ 4) H_2O

36. After the electrolysis of aqueous solution of NaCl using Pt electrodes, the pH of the solution
1) Increases 2) decreases 3) remains constant 4) becomes zero
Hint; During electrolysis NaOH is formed.

37. Aqueous solution of $AgNO_3$ is electrolysed using inert electrodes. At the end of electrolysis
1) pH of the solution increases 2) pH of the solution decreases
3) pH of the solution remains unchanged 4) pH of the solution becomes 14
Hint; during electrolysis HNO_3 is formed.

38) 1M aqueous $CuSO_4$ solution is electrolysed by using copper electrodes for 30 minutes. The concentration of $CuSO_4$ after electrolysis is

1)1M 2)0.75M 3)0.5M 4)0.25M

Hint; during electrolysis using active electrodes the composition of electrolyte remains same.

39. According to Kohlrausch law, the limiting value of molar conductivity of an electrolyte A_2B is
1) $\lambda^{\infty}_{A^+} + \lambda^{\infty}_{B^{-2}}$ 2) $\frac{1}{2}\lambda^{\infty}_{A^+} + \lambda^{\infty}_{B^{-2}}$
3) $2\lambda^{\infty}_{A^+} + \frac{1}{2}\lambda^{\infty}_{B^{-2}}$ 4) $2\lambda^{\infty}_{A^+} + \lambda^{\infty}_{B^{-2}}$

40. The expression showing the relationship between equivalent conductivity and molar conductivity of aq. H_2SO_4 is
1) $\lambda_m = 2 \times \lambda_{eq}$ 2) $\lambda_{eq} = 2 \times \lambda_m$ 3) $\lambda_m = 2 / \lambda_{eq}$ 4) $\lambda_m = 4X\ \lambda_{eq}$

41. The molar conductivities Λ^0_{NaOAc} and Λ^0_{HCl} at infinite dilution in water at 25^0C and 91.0 and 426.2 S cm^2 / mol respectively. To calculate Λ^0_{HOAc} the additional value required is
1) Λ^0_{NaCl} 2) $\Lambda^0_{H_2O}$ 3) Λ^0_{NaOH} 4) Λ^0_{KCl}

42. The conductivity of 0.001 M acetic acid is 5×10^{-5} S cm^{-1} and Λ^0 is 500 S cm^2 mol^{-1} then the calculated value of dissociation constant of acetic acid would be
1) 10^{-4} 2) 10^{-5} 3) 10^{-6} 4) 10^{-3}
Solution: $\Lambda_c = K \times 1000/M = 1000 \times 5 \times 10^{-5} / 0.001 = 50$

Degree of dissociation $\alpha = \Lambda_c/\Lambda_o = 50/500 = 0.1$, $K_a = c\alpha^2 = 0.001 \times (0.1)^2 = 10^{-5}$

43. The distance between two electrodes of a cell is 2.5 cm and area of each electrode is 5 cm^2 the cell constant (in cm^{-1}) is
1) 2 2) 12.5 3) 7.5 4) 0.5
Hint; cell constant=l/a

44. The limiting molar conductivities Λ_o for NaCl, KBr an KCl are 126, 152 and 150 S. cm^2 mol^{-1} respectively. Then Λo for NaBr is
1) 128 S cm^2 mol^{-1} 2) 302 S cm^2 mol^{-1}
3) 278 S cm^2 mol^{-1} 4) 176 S cm^2 mol^{-1}
Hint; $\Lambda_o$of NaBr= Λ_o NaCl + Λ_o KBr -Λ_o KCl

45. Which of the following solutions of NaCl has the higher specific conductance?
1) 0.001N 2) 0.01N 3) 0.1 N 4) 1 N
Hint; The value of K increases with increase in concentration.

46. Molar conductivity of a solution is 1.26×10^2 Scm^2mol^{-1}. Its molarity is 0.01M. Its specific conductivity will be
1) 1.26×10^{-5} 2) 1.26×10^{-3} 3) 1.26×10^{-4} 4) 0.0063
Hint; λ_c=KX1000/M

47. The values of equivalent conductivity at infinte dilutions for NH_4Cl , NaOH and NaCl are respectively 149.74, 248.1 and 126.4 ohm^{-1} cm^2 $equi^{-1}$. The value of Λ_{eq} of NH_4OH is
1) 371.44 2) 271.44 3) 71.44 4) 224.76
Hint; Λ_{eq} of NH_4OH= Λ_{eq} of NH_4Cl + Λ_{eq} of NaOH+ Λ_{eq} of NaCl

48. Molar ionic conductivities of a bivalent electrolyte are 57 and 73. The molar conductivity of the solution will be
1) 130 S cm^2 mol^{-1} 2) 65 S cm^2 mol^{-1} 3) 260 S cm^2 mol^{-1} 4) 187 S cm^2 mol^{-1}
Hint; molar conductivity of the solution =Sum of Molar ionic conductivities=57+73=130

49. At a certain temperature and at infinite dilution, the equivalent conductances of sodium benzoate, hydrochloric acid and sodium chloride are 240, 349 and 229 ohm^{-1} cm^2 $equiv^{-1}$ respectively. The equivalent conductance of benzoic acid in ohm^{-1} cm^2 $equiv^{-1}$ at the same conditions is
1) 80 2) 328 3) 360 4) 408
Hint; Λ_o ofC_6H_5COOH= Λ_o ofC_6H_5COONa+ Λ_o ofHCl - Λ_o ofNaCl

50) The resistance of 1N solution of acetic acid is 250 Ohm.If the cell constant is 1.15 cm^{-1},then the equivalent conductance will be
1)4.6 Ohm^{-1} cm^2eq-1 2) 9.2 Ohm^{-1} cm^2eq-1 3) 18.4 Ohm^{-1} cm^2eq-1 4) 0.023 Ohm^{-1} cm^2eq-1
Hint;K=(1/R)X l/A=1.15/250=4.6X10^{-3},Λ=K X1000/N=4.6

51. The equivalent conductance of 1 M H_2SO_4 solution having conductivity

26×10^{-2} ohm^{-1} cm^{-1} is (in $ohm^{-1}cm^2$ eq^{-1})
1) 260 2) 130 3) 5 4) 10
Hint; For H_2SO_4 Normality N=MX2=2N
Λ_{eq}=K X1000/N=26×10^{-2}X1000/2= 130

52. Equivalent conductance of A_xB_y at infinite dilution will be
1) $\lambda^\infty = x\lambda^\infty_A + \lambda^\infty_B$ 2) $\lambda^\infty = x\lambda^\infty_A + y\lambda^\infty_B$ 3) $\overset{\infty}{\lambda} = x\overset{\infty}{\lambda}^{y+}_A + y\overset{\infty}{\lambda}_B$ 4) All are correct

53. Specific conductivity of 0.1 M solution of KCl at 18^0 C is 1.12 S. m^{-1} and resistance is 50 ohm. Then cell constant is

1) 56 m^{-1} 2) 5.6 m^{-1} 3) 11.2 m^{-1} 4) 1.12 m^{-1}

Hint; cell constant [l/a]= KxR

54. Resistance of 1.0 M aq. solution of an electrolyte is 40 ohm. If area of the electrode of the cell is 3.0 cm^2 & the distance between the electrodes is 1.5 cm, the molar conductivity of the solution is

1) 52 ohm^{-1} cm^2 mol^{-1} 2) 24 ohm^{-1} cm^2 mol^{-1}

3) 12.5 ohm^{-1} cm^2 mol^{-1} 4) 5.2 ohm^{-1} cm^2 mol^{-1}

55. Equivalent conductance at infinite dilution of $BaCl_2$, H_2SO_4 and $HCl_{(aq)}$ solutions are x_1, x_2 & x_3 respectively. The equivalent conductance of Ba_2SO_4 at infinite dilution is

1) $x_1 + x_2 - 2x_3$ 2) $x_1 + x_2 - x_3$ 3) $x_1 - x_2 + x_3$ 4) $x_1 + 2x_2 + x_3$

56. Equivalent conductance of 1 M CH_3COOH is 10 ohm^{-1} cm^2 $equival^{-1}$ and at infinite dilution is 200 ohm^{-1} cm^2 $equiv^{-1}$. The percentage ionization of CH_3COOH in the 1 M solution is

1) 5 % 2) 2% 3) 4% 4) 1%

Hint; $\%\alpha = (\Lambda_c/\Lambda_o)$ X100= (10/200)100=5%

57. The specific conductance of 0.1 M HNO_3 is 6.3×10^{-2} ohm^{-1} cm^{-1}. The molar conductance of the solution is

1) 630 ohm^{-1} cm^2 2) 315 ohm^{-1} cm^2 3) 100 ohm^{-1} cm^2 4) 6300 ohm^{-1} cm^2

Hint; λ=KX1000/M

58. The resistance of 0.01N solution of an electrolyte AB at 328 K is 100 ohm. The specific conductance of solution is (cell constant = $1cm^{-1}$)

1) 100 ohm 2) 10^{-2} ohm^{-1} 3) 10^2 ohm-cm 4) 10^{-2} ohm^{-1} cm^{-1}

Hint; $K=\frac{1}{R} X \frac{l}{a}$ = (1/100) X1=$10^{-2}$$ohm^{-1}$ cm^{-1}

59. For an electrolytic solution of 0.05 mol L^{-1}, the conductivity has been found to be 0.011 S Cm^{-1}. The molar conductivity is

1) 0.055 S cm^2 mol^{-1} 2) 550 S cm^2 mol^{-1}

3) 0.22 S cm^2 mol^{-1} 4) 220 S cm^2 mol^{-1}

Hint; λ=KX1000/M

60. For which of the following electrolyte the value of molar conductivity and equivalent conductivity are same

1) Na_2SO_4 2) KCl 3) $Al_2(SO_4)_3$ 4) $BaCl_2$

KEY

1) 3	2) 3	3) 2	4) 2	5) 3	6) 2	7) 4	8)4	9) 2	10) 3
11) 3	12) 1	13) 4	14) 4	15) 1	16) 3	17) 4	18)1	19) 3	20) 4
21)2	22)4	23)3	24)4	25) 1	26) 4	27)4	28) 1	29) 3	30) 2
31) 4	32) 4	33) 1	34) 4	35) 2	36) 1	37) 2	38) 1	39)4	40)1
41) 1	42)3	43) 4	44) 1	45)4	46)2	47) 2	48) 1	49) 3	50) 1
51)2	52)3	53)1	54)3	55)1	56)1	57)1	58)4	59)4	60)2